

Testimony Regarding RSB 376: An Act Concerning State Grant Commitments for School Building Projects and Concerning Changes to the Statutes Concerning School Building Projects

Senator Gaffey, Representative Fleischmann and other members of the Education Committee, my name is Joellen Lawson and I am submitting testimony in strong support of specific changes to statutes concerning school building projects that would make the repair and replacement of school HVAC systems eligible for reimbursement.

I am the founder and Honorary President of the Connecticut Foundation for Environmentally Safe Schools (ConnFESS) as well as a board member for the Healthy Schools Network, Inc., a national 501©3 research, information, education and advocacy organization located in Albany, New York.

ConnFESS is a state-based nonprofit organization dedicated to promoting policies, practices and resources that protect school occupants from preventable environmental health hazards. At the state level, ConnFESS is a member of:

1. The Connecticut School Indoor Environment Resource Team (CSIERT) coordinated by the State Department of Public Health
2. The Coalition for a Safe and Healthy Connecticut

In February 2010 ConnFESS revised its School Ventilation Position Statement which is attached to my testimony. As we begin the endorsement process, organizations such as CT Parent Teacher Association (CT PTA), American Lung Association of CT (ALACT), CT Sierra Club, CT Occupational Safety and Health (COSH) and Ecological Health Organization (ECHO) have already endorsed it. Many others are expected to do so soon.

While preparing this testimony I was struck by the realization that in 2010 we will mark the tenth anniversary for both the release of the Connecticut CASE (CT Academy of Science and Engineering) Report on Indoor Air Quality in CT Schools and the permanent closure of the former McKinley School in Fairfield. My twenty-three year teaching career ended in a disability retirement due to permanent, chronic and debilitating health conditions that medical experts attribute to exposure to indoor air pollution at the former McKinley School.

Attached to my testimony is a summary of six statements taken from the CASE report issued in July 2000 that focus on the critical relationship between heating, ventilation and air conditioning (HVAC) systems and indoor air quality (IAQ). When HVAC systems are properly designed, maintained and operated they can significantly dilute and flush out indoor air pollutants. According to the 2000 CASE Report: "The most important direct cause of poor air quality is inadequate fresh air ventilation regardless of what other factors may contribute to this condition" and poorly designed, operated, and maintained HVAC systems accounted for the majority of indoor air quality problems in Connecticut's schools. In some cases the HVAC system has actually become a source of contamination. Such a potential scenario is well described in an article that appeared in the Journal of School Health in 2007 which said: "Indoor air pollution can originate within buildings' heating, ventilation, and air conditioning equipment (HVAC equipment) through microbiological growth in drip pans, duct work coils and humidifiers; improper venting of combustion products; and dust debris in duct work."

McKinley became a national poster child for the consequences of severe mold contamination and deferred maintenance. The most serious school indoor air quality problems, like those found in McKinley, usually involve the interaction of moisture incursion, poor ventilation, and contamination from a variety of biological and chemical sources. Mold contamination combined with inadequate air circulation was a recipe for a disaster at McKinley. Ventilation issues at McKinley received far less attention and publicity than the mold infestation did.

In January 2001, Turner Building Sciences submitted its Initial HVAC and IAQ Evaluation to the Fairfield Board of Education. This evaluation stated: "The current minimum ventilation rates of the tested classrooms are well below the guidelines recommended by ASHRAE. At current ventilation recommendations, Classroom 109 could handle a population of 6, Classroom 202 a population of 2, Classroom 218 a population of 12 and classroom 117 a population of 7." (ASHRAE refers to the American Society of Heating, Refrigerating, and Air Condition Engineers) These were standard sized classrooms that had been used by many more students than these IAQ experts deemed was acceptable. Such inadequate ventilation is also disconcerting because:

1. School buildings are one of the most densely occupied indoor spaces. Four times as many occupants per square foot are found in schools compared to office spaces.
2. Children who are the majority of school occupants are more vulnerable to the harmful effects of indoor air pollution by virtue of their size, behaviors, increased metabolic rates and developing organ systems. They take in more air relative to their size than adults do. Children breathe more rapidly and inhale more pollutants per pound of body weight.

The Turner Building Science evaluation of McKinley not only demonstrated inadequate ventilation throughout numerous wings of the school, but also found more problems with how the HVAC system in the Media Center was maintained and operated. Pervasive mold had contaminated the carpets, books and other materials housed in the Media Center. Turner Building Science remarked that such mold growth could have been greatly reduced if the ventilation system had been run year round to control excessive humidity. In addition this report stated: "The HVAC should have its casing liner replaced before the space is reoccupied. The current liner may be dispersing fiberglass fibers into the occupied space." In other words as a result of neglect the HVAC had itself become a source of contamination. Fiberglass can cause rashes and respiratory irritation.

Turner Building Science recommended further engineering studies be conducted to allow for the upgrade or replacement of McKinley's ventilation system. This never happened because the estimated costs to remediate all of McKinley's IAQ problems was equal to or exceeded the cost of dismantling and rebuilding the school which ultimately came to a price tag of about \$28 million dollars. A crucial lesson to be learned from the McKinley story is that it costs less to prevent HVAC and IAQ issues or correct them as soon as they are identified than to fix them when they become more complex, serious and expensive. Over the long term this school community suffered all the consequences the US EPA's Indoor Air Quality Tools for Schools Kit warns about:

1. An unfavorable learning environment that reduced the performance and effectiveness of students, teachers and staff and increased absenteeism

2. Negative publicity damaged the school's and the administration's public image
3. Polarization throughout the school district
4. Strained relationships among parents, teachers and the school administration
5. Accelerated deterioration and reduced efficiency of the school's physical plant
6. Created liability issues as over eighty people reported health problems. Some experienced short symptoms of sick building syndrome. Others still have health challenges as a result of developing long-term permanent "building related illnesses." I lost 50% of my lung function.

More than six years after the passage of An Act Concerning Indoor Air Quality in Schools physicians continue to link the onset and exacerbation of asthma and other lung diseases as well as allergies and sinus infections to unhealthy environmental conditions in schools with poorly designed, maintained and operated HVAC systems. Unfortunately, even when ventilation problems are identified, districts tend to delay, postpone or ignore the need for HVAC repairs and upgrades because as the 2000 CASE report noted: "Connecticut laws permit reimbursement only for code corrections, new construction, or new features added to existing facilities. However, costs of repair of existing facilities (e.g. Cleaning and repairing HVAC systems) are not eligible at this time."

School districts like Westport and Berlin had known for at least a decade that there were school facilities in need of HVAC repair and upgrades. Both districts have recently budgeted for such repairs and upgrades and deserve praise for finally taking this step. However, it is also necessary to recognize that:

1. During the time that these improvements were delayed school children, teachers and staff reported cases of sick building syndrome and building related illnesses.
2. Actions taken to budget for HVAC repairs and upgrades were greatly influenced by highly vocal and persistent advocates in each school community.

Superintendents and Boards of Education have a difficult job especially when they must balance and prioritize many complicated and competing needs when preparing budgets. When the state does not reimburse for HVAC upgrades and repairs one might erroneously assume that a school's HVAC system is not vital component to creating a healthy and productive learning environment.

School districts that implement an active, ongoing IAQ management plan such as Tools for Schools are much more likely to be educated about the benefits of optimal ventilation systems. Those who have taken advantage of the free training offered by the CT Department of Public Health on school IAQ will be much more familiar with no or low cost ways to achieve energy efficiency while also sustaining healthy indoor air quality. It is not known for sure how many districts currently utilize a written indoor air quality management plan to inform decisions about capital budget requests. Anecdotal feedback tells us the level of commitment, competence and consistency in effectively employing an IAQ management plan varies. Some school districts are doing a better job than others. There are school districts that are not implementing any IAQ program and are not in compliance with the 2003 IAQ for Schools Law.

The good news is that over the last decade advancements in HVAC technology can make it easier to balance energy efficiency, optimal indoor air quality and cost savings. It is possible to have healthier people and a healthier planet without busting one's budget. The U.S. EPA's Design Tools for Schools (www.epa.gov/iaq/schooldesign/hvac.html) explains how engineers can design HVAC systems that are:

1. cost competitive with traditional ventilation designs
2. provide the appropriate quality and quantity of outdoor air
3. lower energy costs
4. simplify maintenance

During the past ten years an even more robust body of research explains how inadequate air exchange can significantly impair the comfort, health and productivity of our school children and personnel. The prominent role HVAC systems play in creating healthy and productive learning environments is documented in scientific literature published by:

1. The US Department of Education (2004)
2. Centers for Disease Control (2006)
3. National Academy of Sciences (2006)
4. Indoor Environmental Department of the Lawrence Berkeley National Laboratory (web site initially posted in April 2008)
5. World Health Organization (2009)
6. Federal Interagency Committee on Indoor Air Quality (Feb. 2010)

The overall consensus derived from these resources is that school buildings need:

1. Optimal ventilation rates (ASHARE standards or better.)
2. Frequent and thorough inspections of HVAC systems - at least once a year.
3. Ongoing upgrades, maintenance and repair of HVAC systems on a timely basis.

The Lawrence Berkeley Laboratory launched its IAQ Scientific Findings Resource Bank (IAQ SFRB) in 2008 to provide concise regularly updated summary information that is well supported by scientific research on the impacts of building ventilation on health and performance. Fact sheets are posted on Implications for Good Ventilation Practices, Ventilation Rates and Respiratory Illness, Ventilation Rates and Sick Building Syndrome Symptoms, Ventilation Rates in Offices and Schools, as well as Ventilation Rates and Office work Performance which can be found at www.iaqscience.lbl.gov/vent-info.html.

Last July when the World Health Organization published its guidelines for indoor air quality, an entire chapter was devoted to Moisture Control and Ventilation. This chapter discussed the affects of

ventilation design, installation, repair and operation on temperature, humidity, control of asthma, triggers such as mold and dust mites, the comfort and health of occupants and the structural integrity of buildings.

The Indoor Air Quality Guide (Best Practices for Design, Construction and Commissioning) developed by the Federal Interagency Committee on Indoor Air Quality (February 3, 2010) stressed that:

1. "Good IAQ is part of sustainability. It ain't just energy efficiency."
2. IAQ impacts on design decisions are not always appreciated or considered early enough in the design process
3. The top 4 reasons for IAQ Problems involve a "Failure to address IAQ during design, construction and commissioning."

To some degree regulations for the CT High Performance Building Construction Standards for State Funded Buildings (approved in 2009) do address these concerns raised in this Feb. 2010 presentation and companion CD.

As legislation is crafted to address HVAC systems and IAQ it is important to be cognizant of the following factors:

1. Unlike IAQ laws in California and Maine, Connecticut statutes do not require all schools to conduct annual HVAC inspections
2. Strong requirements for HVAC design, operations and maintenance have been established by CT's High Performance Building Standards for State Buildings and the 2003 IAQ for schools law. These should be reviewed and incorporated into legislative language.
3. The Connecticut State Department of Education's School Facilities Survey (ED050) does not have specific questions that track compliance with existing statutes that require:
 - a. Operating HVAC systems continuously during the hours in which students and staff occupy school facilities
 - b. Staff training on ventilation system for optimal energy efficiency and superior IAQ.
 - c. Keeping HVAC maintenance records on file for five years.

When existing statutes are not being adequately audited for compliance an inherent underlying message is conveyed that they are not very important and become, in reality, "optional". When this mindset takes hold school officials become complacent and disengaged from the ongoing vigilance and planning that must be in place to avoid an IAQ crisis.

We hope the Education Committee will incorporate legislative language that reflects an understanding of how quality ventilation is key to a quality education. ConnFESS enthusiastically supports making the upgrade and repair of HVAC systems eligible for school construction reimbursement as long as minimum standards are established in order for school districts to qualify for such funding. ConnFESS recommends that these minimum requirements include:

1. Selected regulations from the CT High Performance Building Standards that specifically deal with energy efficiency, ventilation, IAQ and the commissioning of building systems.
2. Local school districts must commit to:
 - a. Providing documentation that proves compliance with existing and new IAQ /HVAC statutes.
 - b. Maintaining a written indoor air quality management plan based on the US EPA's Indoor Air Quality Tools for Schools Programs or its equivalent to be directed by a designated IAQ coordinator.
 - c. Participating in free training when it is offered by the State Department of Public Health related to HVAC and IAQ.

In addition, we respectfully request that this legislation also require:

1. All Connecticut schools to annually inspect HVAC systems and post these inspections on school and/or school district web sites.
2. The State Department of Education to revise the School Facilities Survey to include specific questions that clearly track existing and new statutes dealing with ventilation, energy efficiency and IAQ, as well as the commissioning of building systems.

These recommendations are designed to improve accountability, transparency and to encourage the implementation of research based best practices. Without these minimum standards in place for all Connecticut schools as well as those aimed at school districts that would apply for funding of HVAC repair and upgrades, the State of Connecticut could inadvertently reward neglect and poor management of school facilities.

As our state moves to decrease school construction grants due to more limited bonding and debt service capacity, we support legislation that will make smaller projects to upgrade and repair HVAC systems eligible for reimbursement because such allocations could:

1. Promote:
 - a. Job growth
 - b. Use of green technologies in schools
 - c. Cost savings through energy efficiency
 - d. Increased public awareness of the substantial role of HVAC systems in creating healthier, safer, and more productive learning environments
 - e. Proven benefits of superior IAQ such as improved test scores, attendance, and teacher retention
2. Protect:
 - a. The health of our students, teachers and staff from sick building syndrome and building related illnesses
 - b. The considerable long-term local and state investments made in our school facilities
 - c. The environment by reducing greenhouse gas emissions

3. Prevent:

- a. Accelerated deterioration and reduced efficiency of a school's physical plant
- b. Negative publicity that damages a school's public image
- c. Strained relationships between parents, teachers, administration and school officials
- d. Liability issues and workers compensation claims
- e. Serious IAQ problems that could force the closing of a school

We applaud the Education Committee for its ongoing leadership in advancing school environmental health policy. ConnFESS and its partners are ready to assist in any way we can to ensure passage of legislation that would strengthen current statutes and amend those needed to make school HVAC and upgrades eligible for reimbursement. Thank you for this opportunity to submit testimony and your consideration of our suggestions.

CT Foundation for Environmentally Safe Schools

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February 2010 School Ventilation Position Statement

INTRODUCTION

The U.S. EPA has consistently ranked indoor air pollution among the top five environmental risks to public health. Indoor air can be five to 100 times more polluted than outdoor air.

School indoor air quality (IAQ) can be especially problematic because:

1. School buildings are one of the most densely occupied indoor spaces. Four times as many occupants per square foot are found in schools compared to office spaces.
2. Children who are the majority of school occupants are more vulnerable to the harmful effects of indoor pollutants by virtue of their size, behaviors, increased metabolic rates and developing organ systems.
3. Many normal, everyday school activities emit pollutants (e.g. ozone from copying machines and chemicals in art and science supplies).
4. Optimal ventilation systems have rarely been installed in schools due to pressures to reduce design and construction costs as well as a lack of awareness of the key role a ventilation system has in diluting and flushing out the concentration of indoor pollutants.

In 2003, PA 03-220: An Act Concerning Indoor Air Quality in Schools was passed by the Connecticut State Legislature by a nearly unanimous vote. Strong support for this law was generated by the conclusions of the Connecticut Academy of Science and Engineering (CASE) 2000 Report, Indoor Air Quality in Connecticut Schools, as well as three years of compelling testimony by children and adults whose health had been irrevocably harmed by poor indoor air quality (IAQ) in schools.

According to the 2000 CASE report on school IAQ, "The most important direct cause of poor air quality is inadequate fresh air ventilation regardless of what other factors may contribute to this condition." Other factors contributing to indoor air pollution come from chemical sources (e.g. formaldehyde from new flooring or furniture or volatile organic compounds used in cleansers or paints) as well as biological sources (e.g. bacteria, fungi and molds found in water damaged walls, carpeting and ceilings). The report also emphasized that poorly designed, operated and maintained HVAC systems (Heating, Ventilation and Air Conditioning Systems) accounted for the majority of indoor air quality problems in Connecticut's schools.

The importance of optimal ventilation rates in school settings cannot be overemphasized. Research has proven that inadequate air exchange affects the health, productivity and achievement of school children and employees. A major conclusion of a 2006 study conducted by the National Academy of Science was:

“The reduction of pollutants loads through increased ventilation and effective filtration has been shown to reduce the occurrence of building – associated symptoms (eye, nose and throat irritations; headaches; fatigue; difficulty breathing; itching and dry irritated skin) and to improve the health and comfort of building occupants.”

Elevated carbon dioxide levels indicate inadequate oxygen is being provided to school occupants by a building’s ventilation system. When carbon dioxide levels reach 1,000 parts per million (3 times more than what is normally found in the atmosphere), drowsiness, headache and an inability to concentrate ensue. Studies have shown high levels of carbon dioxide impair the ability to perform tasks involving concentration, calculation and memory. When ventilation problems were corrected in a 1996 European study involving 800 students in eight schools, test performance improved.

According to a recent Centers for Disease Control and Prevention (CDC) survey summarized in the October 2007 Journal of School Health, more than half (57.4%) of U.S. states require school districts or schools to conduct periodic inspections of HVAC systems. However, it is not known how many states have an oversight mechanism to verify compliance with this requirement.

It is critical to ensure that indoor air pollution is not being caused by and/or spread throughout the school building by a contaminated HVAC system. This essential point was expressly articulated in this recently published article when it stated: “Indoor air pollutants can originate within the building’s heating, ventilation and air conditioning (HVAC) equipment through microbiological growth in drip pans, duct work, coils, and humidifiers; improper venting of combustion products; and dust or debris in ductwork.”

PROBLEM

More than six years after PA03-220 was enacted, new cases of building related illnesses among school children and employees are still being reported in communities across Connecticut. Physicians have linked the onset of asthma and other lung diseases, allergies and sinus infections to environmental conditions in school facilities that have poorly designed, operated and maintained heating, ventilation and air conditioning systems.

Current state reimbursement for school districts is reserved for code violations, roof replacement, new construction and extensive renovations or additions to existing buildings. Local districts do not upgrade, repair or maintain ventilation systems as often or as thoroughly as is needed because these costs are not eligible for school construction grants.

It is highly unlikely that the repair or upgrade of a ventilation system alone would fulfill the criteria set out in Section 3 of PA03-220 (CT General Statutes 10-282(19)) for “an indoor air quality emergency.” If a school were to receive funding in this way it is probable that school occupant health and productivity has already been adversely impacted. **This approach to funding encourages a crisis intervention rather than a prevention approach to managing indoor air quality issues.**

Sections 2, 6 and 7 of PA03-220: An Act Concerning Indoor Air Quality in Schools address HVAC system issues. Section 2 (CT General Statutes 10-220(d)) requires that facilities constructed, extended, renovated or replaced on or after January 1, 2003 conduct a uniform inspection and evaluation of heating, ventilation and air conditioning systems using a program such as the US EPA's Indoor Air Quality Tools for Schools Program. This inspection must take place prior to January 1, 2008 and every five years thereafter. The results of this inspection must be made available for public inspection at a regularly scheduled local or regional board of education meeting.

Unlike IAQ laws in California and Maine, Connecticut statutes do not require all schools to perform annual HVAC inspections. The 2000 CASE report on school IAQ specifically recommended that HVAC systems in CT schools be inspected annually. In order to adequately protect school children and employees from harmful indoor air pollution exposure, all Connecticut schools need to conduct a basic inspection of HVAC systems annually. This basic inspection does not need to be time consuming or costly and can detect or correct minor problems before school occupants are negatively affected. For example, such a basic inspection would ensure that all air intakes and exhausts are open, operating and unobstructed and that no intake is situated in a way that would bring contaminants into the building from other sources such as exhaust vents, standing water or idling vehicles. More comprehensive inspections that may involve balancing of HVAC air handling and ventilation systems need only occur every five years. Requirements for basic annual inspections in contrast to those conducted every five years need to be defined and tracked for compliance.

Section 6 of PA03-220 (CT General Statutes 10-291) states that the CT Department of Education shall not approve a school building project for new construction, extension, renovation or replacement unless plans include a plan to ensure that building maintenance staff are or will be trained in heating, ventilation and air conditioning systems with specific training relative to indoor air quality. School officials do not present a plan to the CT Department of Education. They are not asked in their application or the School Facilities Survey (ED050) to specify:

- A) What training was provided?
- B) When the training was presented?
- C) Who conducted the training?
- D) How mastery of skills was assessed?

The superintendent, architect and engineer sign an "Indoor Air Quality Certification" form to indicate that they are in compliance with these requirements. No further auditing or oversight is done before school districts receive state funding for new construction, extension, renovation or replacement of a school building.

Section 7 (CT General Statutes 10-231(e)) stipulates that effective July 1, 2003 each local and regional school board shall ensure that its HVAC (Heating, Ventilation and Air Conditioning) systems are maintained and operated at the prevailing maintenance standard at the time of its installation or renovation of such system.

The current prevailing standard was developed by the American Society of Heating, Ventilation and Air Conditioning Engineers (ASHRAE). It requires minimum rates of fresh outdoor air exchanges into buildings based on specific occupancy patterns. Section 7 also insists that:

- A) HVAC systems be operated continuously during the hours in which students and school personnel occupy school facilities.
- B) HVAC maintenance records be kept on file for at least for five years.

It is not known how many Connecticut schools do or do not meet ASHRAE ventilation standards. The CDC's 2006 School Health Policies and Programs Study (SHPPS 2006) found that of the 424 out of 720 school districts nationally who responded to their questionnaire, only 37% required their school districts to meet ASHRAE ventilation standards.

The CT SDE's School Facilities Survey (ED050) does not have questions that would track:

- A) How many CT schools meet ASHRAE ventilation standards
- B) Whether or not HVAC systems are operated as specified by PA03-220
- C) Whether or not HVAC maintenance records are kept for five years as is required by PA03-220

SOLUTION

Pass legislation that will:

1. Require all CT schools to conduct annual HVAC inspections and post the results of these inspections on school and/or school district websites.
2. Revise the SDE School Facilities Survey (ED050) to include more specific questions dealing with existing statutes that require:
 - Operating HVAC systems continuously during the hours in which students and school personnel occupy school facilities
 - Keeping HVAC maintenance records for 5 years
 - Staff training on ventilation system for optimal energy efficiency and superior IAQ
3. Make the upgrade and repair of school ventilation systems eligible for school construction reimbursement grants provided that the upgrade is done to high energy efficiency and ventilation standards, and that documentation verifying this is provided.
4. Establish minimum standards that school districts who upgrade or repair HVAC systems must meet to be funded by the state of Connecticut, such as following selected regulations from the High Performance Building Standards for State Funded Buildings dealing with ventilation systems and indoor air quality.

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The Connecticut Academy of Science and Engineering (CASE) Report on Indoor Air Quality in Connecticut Schools, July 25, 2000

Statements Regarding Indoor Air Quality and HVAC (Heating, Ventilation and Air Conditioning) Systems:

- 1) "The most important direct cause of poor air quality is inadequate fresh air ventilation regardless of what other factors may contribute to this condition."
- 2) Poorly designed, operated and maintained HVAC systems accounted for the majority of indoor air quality problems in Connecticut's schools.
- 3) Annual inspection of school HVAC systems should be required.
- 4) "Poor maintenance and operation by untrained personnel exacerbate indoor air problems related to HVAC systems."
- 5) "Connecticut schools are heated, ventilated and air conditioned using a variety of HVAC systems. These systems are often selected based on cost and are therefore usually inadequate in many respects."
- 6) "Connecticut laws permit grant reimbursement only for code corrections, new construction or new features added to existing facilities. However, costs for the repair of existing facilities (e.g. cleaning and repairing of HVAC systems) are not eligible at this time."